

# Anterior chamber angle measurement with schiempflug cornea



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## Anterior Chamber Angle Measurement with Scheimpflug Cornea Topography and Selective Laser Trabeculoplasty

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### ABSTRACT

**Background and Objective:** To evaluate anterior chamber angle (ACA) with Scheimpflug corneal topography before and after selective laser trabeculoplasty (SLT) treatment.

**Materials and Methods:** A prospective cross sectional study performed on 55 eyes of 28 primary open angle glaucoma patients. A single session of SLT was done at previously untreated, phacic, non-operated, clear corneal eyes. Intraocular pressure and corneal topographic measurements were done before and after SLT treatment.

**Results:** After follow up of 3 months, mean IOP and central corneal thickness measurements was found significantly reduced ( $p=0,00$ ,  $p=0,003$  respectively). On the other hand mean ACA measurements difference was found insignificant ( $p=0,194$ )

**Conclusion:** SLT is an effective tool for glaucoma treatment. Although it is applied on trabecular meshwork it seems to cause no significant change at ACA measurements.

### Introduction

Glaucoma is a progressive neuropathy localized in the optic nerve and it is among the leading causes of blindness worldwide(1). Intraocular pressure (IOP) control seems to be the best treatment that slows progression in glaucoma. There are several methods to reduce IOP such as pharmaceutical treatment, laser treatment and surgery. Selective laser trabeculoplasty (SLT), described by Latina and Park in 1995 uses a frequency-doubled short pulse (Q-switched) Nd: YAG laser and the name “ selective” has been given due to its targeting of pigmented trabecular meshwork cells while leaving the meshwork microstructure intact at anterior chamber angle (ACA)(2). Minimal mechanical damage was shown at histologic sections of ACA of human and primate after SLT treatment(3-5).

Several instruments have been developed to image the anterior segment of the eye, one of them is rotating scheimpflug corneal tomography (SCT). SCT instrument uses a rotating camera that can image the anterior segment in 3 dimensions together with a second camera which captures eye movement for improved orientation of the images obtained by the rotating camera. Recently, there are some researches present about clinical usefulness and reliability of SCT at analysis of ACA and differentiation and follow up of patients with glaucoma(6-9). With these knowledge, a question may arise in mind that is there any change happens at anterior chamber angle measured by the scheimpflug corneal tomography after SLT. The following prospective study was designed to determine whether ACA measurements done by the scheimpflug corneal topography could be affected by SLT.

## Materials and Methods

A prospective cross sectional study was designed to evaluate the effects of SLT treatment at ACA measurements. The study was conducted from January 2014 to December 2014. All authors followed the Tenets of the Declaration of Helsinki. Local ethic committee approval was taken. Informed consent was obtained prior to treatment.

Primary open angle glaucoma patients who were older than 18 years of age, previously untreated with laser or filtering surgery, were included in this study. Patients with anterior segment pathologies and who could not be followed for at least 3 months were excluded. Gonioscopic examination was done to every patient in order to rule out any angle pathology and to select patients with open angle glaucoma. 55 eyes of 28 patients were found eligible for this study. Complete ophthalmologic examination was done before SLT treatment and 3 months after the treatment. The IOP values before and after SLT were measured with a calibrated Goldmann tonometer . SLT treatment was given either for decreasing IOP levels at medically uncontrolled patients or for decreasing the amount of medical therapy. SLT treatment was performed by the same ophthalmologist. SCT measurements were taken by another ophthalmologist.

SCT measurements were taken prior to SLT and after three months with SCT (Sirius™ Costruzione Strumenti Oftalmici, Italy). All measurements were obtained between 10: 00 and 16: 00 o'clock to minimize diurnal variation.

Laser spots between 45 to 50 were applied at superior 180° segment with the SLT Solo laser (Ellex, Adelaide, Australia) to the trabecular meshwork. The energy levels were changed from 0. 8 to 1. 3 mj until a bubble formation

was observed. All patients continued with the same pharmaceutical treatment after SLT.

Statistical analysis was performed using SPSS 11.0 for Windows. The normality of the data was checked by using the Kolmogorov-Smirnov test. Paired-sample Student's t test and chi square test were used for comparison. A p-value of less than 0.05 was taken to denote statistical significance.

## Results

Twenty eight patients were enrolled for this study but one of the patients was pseudophakic so her operated eye was excluded from the study. The number of male and female patients were 14. Ages of the patients were between 39 to 73 (mean  $57.49 \pm 9.31$ ).

Preoperative and postoperative third month IOP, anterior chamber angle and central corneal thickness (CCT) measurements were found to be normally distributed with Kolmogorov Smirnov test ( $p=0.14$ ,  $p=0.23$ ,  $p=0.79$  respectively).

Mean baseline best corrected visual acuity (BCVA) was measured  $0.12 \pm 0.19$  ( $\pm 2SD$ ,  $n=55$ ) LogMar. Third month after treatment, mean BCVA was found  $0.13 \pm 0.23$  ( $\pm 2SD$ ,  $n=55$ ). BCVA of patients were not affected from the SLT treatment ( $p=0.53$ ).

Mean preoperative and postoperative IOP was  $17.96 \pm 4.06$  mmHg ( $\pm 2SD$ ,  $n=55$ );  $15.75 \pm 4.16$  mmHg ( $\pm 2SD$ ,  $n=55$ ) respectively. Comparison of IOP values was found statistically significant ( $p=0.00$ ). When successful

treatment was considered more than 15 % IOP reduction, 58. 2% of patients were found to be successfully treated.

ACA measurements prior to SLT were changed between 28° to 54° (mean 40. 18° ±5. 97° (±2SD, n= 55)). Third month after SLT, ACA values were between 28° and 53° (mean 40. 51°±5. 68° (±2SD, n= 55)). Pre and post treatment ACA values were not significantly different (p= 0. 194).

CCT measurements were ranging between 417µm and 624 µm prior to SLT treatment (mean 541. 04 µm ±41. 039 µm (±2SD, n= 55)). CCT values after third month were changing between 410 µm and 630 µm (mean 537. 71 µm ±43, 802 µm (±2SD, n= 55)). A significant reduction was observed between pre and post treatment values of CCT (p= 0. 003).

## Discussion

Since its introduction for treatment of glaucoma SLT is one of the important treatment options of open angle glaucoma (10). Most of the studies about tissue changes after SLT treatment are histologic and showing small destruction of the trabecular meshwork(3-5).

As a treatment option most of the previous studies reported good results with minimal side effects (11-14). Sayin et al reported a decreased mean IOP from 20. 4±5. 9 mmHg to 15. 2±3. 4 mmHg at third month(11). Kaya et al showed a decrease from 22. 7±2. 1 mmHg to 18. 4±2. 0 mmHg at patients with primary open angle glaucoma after third month of SLT treatment(12). At another study done by Rosenfeld et al a significant reduction of IOP at third month of treatment was found and this reduction

was similar to patients treated with argon laser trabeculoplasty(13). Similarly, Cvenkel showed that in 44 eyes with medically uncontrolled OAG, 180° SLT resulted in IOP reduction of greater than 3 mm Hg in 79% of eyes and greater than 6 mm Hg in 40% after 6 months(14). Although our study was not mainly focused on IOP changes, in order to check our treatment efficiency we also analyzed IOP values. A more than 3 mmHg ( $\geq 15\%$ ) IOP reduction at 58.2 % of patients was found with previous reports and this was correlated well with previous reports.

There are a few reports on corneal changes after SLT. Ong et al reported a study analyzing 15 patients and concluded that effect of SLT on normal corneas might be transient and negligible(15). A similar result was found by White et al at another study (16). Lee et al was presented a transient reduction in endothelial cell count and CCT following SLT returning to baseline one month after single session of treatment (17). They have reported a significant reduction at CCT values after one month of treatment. In our study, we also find a significant reduction at mean CCT values ( $p= 0.003$ ). However, it should be noted all these previous studies were done with corneal specular microscopy which is a device to analyze corneal endothelial structure and CCT. Corneal specular microscopy gives no clue about ACA and trabecular meshwork which is the treatment site of SLT. As far as we know, this is the first report about ACA changes measured with a reliable imaging technique and we find no significant change between mean baseline and third month ACA measurements ( $p= 0.194$ ).

## Conclusion

SLT is an effective tool for glaucoma treatment. This study showed no change at ACA measurements taken by SCT after SLT treatment. Additional studies using SCT or different imaging techniques may improve our knowledge about mechanism of action of SLT at ACA.

## **Conflict of interest**

All authors declare no conflict of interest with any commercial or funding organization.

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